

To: Way, Steven[way.steven@epa.gov]
From: Sorrenson - DNR, Allen
Sent: Wed 4/15/2015 3:58:40 PM
Subject: Re: FW: Red and Bonita - Concrete Testing

Thanks for this Steve. The break point for 4" x 8" versus 6" x 12" test cylinders is the maximum nominal particle size of the coarse aggregate at one-inch. Since the max particle size in our mix is one inch, the 4" x 8" cylinders are appropriate; sorry I missed that. I'm also on-board with the slump and air entrapment testing.

Is the sub contractor responsible for arranging for the concrete delivery? Because Type V cement is not an off-the-shelf item, it is best to make the arrangements well in advance. The batch plant will need to have extra Type V cement on hand in the event any of the batches are rejected, and we should have a satellite phone at the site to notify the batch plant immediately if a batch is rejected. (I'm guessing that the concrete will be batched in Durango).

On Wed, Apr 15, 2015 at 7:15 AM, Way, Steven <way.steven@epa.gov> wrote:

Allen,

For you information – I am planning on having START members doing the QA tests on the bulkhead concrete. The sub will do their QC samples too. The note below suggests that the sample spec might be slightly different – it does not matter to me but I wanted your input on this.

Let me know your thoughts.

Thanks,

Steve

PS. Call my cell if you want to talk; I 'm in ND this week.

Steven Way

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From: Petri, Elliott [mailto:Elliott.Petri@WestonSolutions.com]

Sent: Tuesday, April 14, 2015 3:52 PM

To: Way, Steven

Cc: Christner, Jan

Subject: Red and Bonita - Concrete Testing

Hi Steve,

I did some research into the concrete testing requirements for the bulkhead (I did some QC testing of concrete in Japan, seems methods are pretty similar in the USA). I found a firm based in Durango that has the capabilities and certification to do the testing (Trautner Geotech - <http://www.trautnergeotech.com/index.htm>). I spoke with one of their representatives and they recommended doing an average of 3 cores per test that are 4" dia. x 8" long instead of the specified 6" dia. x 12" long cores, I called a second company, based in Salida, and they also recommend using the smaller cores. I have attached the procedures used to make the concrete cylinders.

In my previous projects we did slump testing prior to pouring of the concrete at the site. Slump testing with air entrapment testing helps ensure the concrete meets the designed water content, air content, and that the concrete has not begun to cure in the truck during its transit to the site. This is not outlined in the bulkhead design, but due to the remote nature of the site could be beneficial to ensure quality of the product. I have included a quick summary of how the tests are conducted below:

A slump test is done by an inspector and consists of taking a small sample of the concrete from the shoot of the truck prior to pouring. They take the concrete and place it in three lifts in a cone shaped mold. The mold is 4" at the top, 8" and the bottom, and 12" tall. The lifts

are mechanically mixed via a rod to condense the concrete and avoid large air voids in the mold. The cone is then lifted and the concrete "slumps" based on the design our concrete would go from 12" in height to a minimum of 10".

The air entrapment portion of the test I have seen done is conducted at the same time the slump test is done. It is done by placing concrete in an airtight sampling vessel in lifts, condensing it with the same rod method, ensuring the container is full and no voids are present on the surface, then sealing and measuring the air content.

Below is an outline of what the concrete requirements and the specified testing requirements from the Bulkhead design.

Concrete specs:

- 4000 psi
- V type – sulfate resistant cement
- Admixture – Xypex Admix 1000 or equivalent
- See attached mix design

Testing Outline:

- One set of 3 cylinders (6" dia x 12" long each) per 5 CY of concrete
- Approximately 27 CY concrete = 6 sets of cylinders
- Can pull samples from chute of trucks prior to piping up to/into the mine
- Comply with ASTM C31/C31M-98 – *Standard Practice for Making and Curing Concrete Test Specimens in the Field*
- Molded and Rodded (condensed) in the field in plastic molds
- Placed in heavy weight bags that are placed in the mine on a level surface near the bulkhead for curing.

●□□□□□□□ 7 Day test – remove two cylinders from each set and carefully taken to the lab for final curing

○ One will be tested at 7 days

○ One will be cured in lab conditions for 21 additional days

●□□□□□□□ 28 day test - the remaining cylinder from each set will be removed from the mine and taken to the lab for 28 day testing of in-situ conditions

Please let me know if you have any questions or would like to incorporate these tests or the different core size into the concrete testing plan for the Site.

Thanks,
Elliott

Elliott Petri, PE

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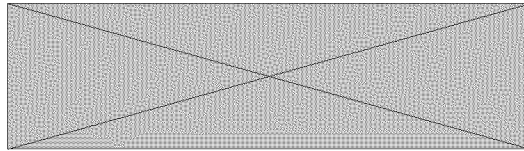
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